REMARKS

A. Regarding the Amendments

After entry of the amendments, claims 1 to 14 will be pending. Claims 1, 2, 4, 5, 10 and 11 have been amended as set forth in the attached "Version With Markings To Show Changes Made". As amended, the claims are supported by the specification and the original claims.

B. Rejection Under 35 U.S.C. §112

The specification is rejected and, correspondingly, claims 1 to 14 are objected to under 35 U.S.C. § 112, second paragraph, as allegedly indefinite.

Regarding claim 1, the terms "in terms of mole" and "once turned into a homogenous solution" are objected to as unclear. As set forth above, these terms have been deleted from claim 1. Accordingly, it is respectfully submitted that the rejection is moot.

Regarding claim 2, the term "resultant suspension containing L-aspartic crystals" is objected to as unclear. As set forth above, the term "resultant suspension" has been deleted from claim 2 and the term "said suspension" has been added. Additionally, claim 1 has been amended to clearly separate the steps of the claimed process. As such, there is a clear antecedent basis for the term "said suspension." It is therefore respectfully requested that the objection to claim 2 be removed and the corresponding rejection of the specification be withdrawn.

Regarding claim 3, the term "moisture containing fumaric acid crystals" is objected to as unclear. As claim 3 does not contain this term, it is respectfully submitted that the rejection is moot. Additionally, it is presumed that the Examiner intended to refer to claim 4. The term "moisture containing" has been deleted from claim 4.

Regarding claim 5, the term "said solution" is objected to as unclear. The claim has been amended to clarify that "said solution" is "said resultant mixture" as set forth in claim 1. It is therefore respectfully requested that the objection to claim 5 be removed and the corresponding rejection of the specification be withdrawn.

C. Rejection Under 35 U.S.C. §103

Claims 1 to 14 are rejected under 35 U.S.C. § 103 as allegedly anticipated by the Nore, *et al.* reference, in combination with the Brun, *et al.*, Pavia, *et al.*, and Tan, *et al.* references. Nore, *et al.*, alone, or in combination with the cited references does not teach or suggest all of the elements of the present invention. As such, the present invention is not obvious in light of the cited references. The rejection is respectfully traversed.

Nore, *et al.* discloses a process of preparing aspartic acid wherein alcoholic fumaric acid is added to ammonium aspartate followed by heating to about 50° C and crystallization of a homogenous solution at a temperature of about 25° to 100° C. However, Nore, *et al.* demonstrate that the use of fumaric acid in an alcoholic solution makes it possible to increase the L-aspartic acid yield. Additionally, Nore, *et al.* does not require a crystallization operation on the L-aspartic acid before filtration (col. 1, lines 18-22), and the L-aspartic acid formed precipitates and crystallizes instantaneously (col. 1, lines 49-50). Therefore, Nore, *et al.* teaches that the precipitates and crystals of L-aspartic acid are obtained without steps of heating and crystallizing.

In the examples of Nore, *et al*, it appears that the change of the temperature in the medium is generated by the mixing, as the temperature does not increase until stirred with a magnetic stirrer. The solution increases in temperature, then, as can be seen in Example 1, the cooling is performed just prior to filtration under vacuum.

Additionally, while Nore, *et al.* indicates a cooling range from 50°C to 30°C, there is no indication of the time in which that cooling occurs. The time over which such cooling would occur to optimize the crystallization of the desired product is not well known to one of skill in the art.

As set forth above, the present invention can be distinguished from the Nore, *et al.* reference due to the failure of Nore, *et al.* to teach crystallization prior to filtration, and the failure to disclose a time frame for the cooling to optimize crystallization of the desired product.

It is alleged that Nore, *et al.*, in view of Brun, *et al.* is obvious. This rejection is respectfully traversed. As set forth by the Examiner, Brun, *et al.* teaches a similar process for preparing L-aspartic acid, using a temperature of 135°C and gradual cooling of the reaction products. However, as in Nore, *et al.*, there is no teaching or suggestion regarding the time frame for the gradual cooling. Further, Brun, *et al.* disclose that the temperature of the reaction mixtures were maintained at 20°C, 100°C, and 135°C, with the mixture at 20°C yielding the best results (Table I). Accordingly, even in combination, the Nore, *et al.* and Brun, *et al.* references do not teach the gradual cooling of the present invention.

Similarly, Pavia, *et al.* or Tan, *et al.*, in combination with Nore, *et al.* do not teach or suggest all of the claimed elements of the present invention. These references discuss the removal of a solvent in a crystallization process and the use of recycling to maximize yield of a crystallized product, but neither in combination, with Nore, *et al.* teaches the gradual cooling of the present invention.

As set forth above, none of the cited references, alone or in combination teach or suggest a method for producing L-aspartic acid, comprising: treating an ammonium fumarate solution with aspartase to generate and ammonium L-aspartate solution, heating the solution to 50-130°C, adding fumaric acid to the ammonium L-aspartate solution, applying a shearing force to the resultant mixture to obtain homogenous solution, and crystallizing L-aspartic acid from the homogenous solution by cooling the solution at an optimum rate. Accordingly, it is respectfully requested that the rejection be withdrawn.

No fee is deemed necessary in connection with the filing of this response. However, if any fee is deemed necessary, the Commissioner is authorized to charge (or apply any credits to) Deposit Account No.: 50-1355. The Examiner is invited to contact Applicants' undersigned representative if there are any questions related to this matter.

Respectfully submitted,

Date: 5/9/01

Lisa A. Haile, J.D., Ph.D.
Registration No. 38,347
Telephone: (858) 677-1456
Facsimile: (858) 677-1465

GRAY CARY WARE & FREIDENRICH LLP
4365 Executive Drive, Suite 1600
San Diego, California 92121-2189

USPTO Customer Number 28213

Applicants:
Mukouyama et al.
Application No.: 09/408,142
Filed: September 29, 1999

VERSION WITH MARKINGS TO SHOW CHANGES MADE

(Amended) A method for producing L-aspartic acid comprising:

[treating an ammonium fumarate solution with aspartase to generate an ammonium L-aspartate solution;

adding fumarate acid to said solution: and then crystallizing L- aspartic acid from said solution, wherein fumaric acid is added to said ammonium L-aspartate solution after said solution has been heated to 50 to 130° C in an amount 0.4 to 0.8 times the total amount of fumarate and the L-aspartate contained therein in terms of mole, and the resultant mixture is once turned into a homogenous solution by applying thereto a shearing force, and then L-aspartic acid is deposited therefrom]

treating an ammonium fumarate solution with aspartase to generate an ammonium L-aspartate solution;

heating to 50 to 130°C said ammonium L-aspartate solution;

adding fumaric acid to said heated ammonium L-aspartate solution in a molar ratio of 0.4 to 0.8 to the total amount of fumarate and the L-aspartate contained therein to form a resultant mixture;

applying a shearing force to the resultant mixture to obtain a homogenous solution; and

crystallizing L-aspartic acid from said homogenous solution to obtain a suspension containing L-aspartic acid crystals.

2. (Amended) The method according to claim 1, wherein the temperature of [resultant suspension] said suspension containing L-aspartic acid crystals is in the range from 25 to 100°C when the deposited L-aspartic acid is separated therefrom.

4. (Amended) The method according to claim 1, wherein [moisture-containing] fumaric acid crystals and said ammonium L-aspartate solution are mixed continuously.

5. (Amended) The method according to claim 1, wherein [said solution] said resultant mixture is cooled at a rate of 0.1 - 5°C /min from the temperature at which fumaric acid is added thereto to the temperature at which crystallized L-aspartic acid is separated therefrom, to thereby deposit L-aspartic acid.

10. (Amended) A method for producing L-aspartic acid comprising:

[treating an ammonium fumarate solution with aspartase to generate an ammonium L-aspartate solution;

adding fumaric acid to said solution and then crystallizing L- aspartic acid from said solution, wherein said solution is cooled at a rate of 0.1-5°C/min from the temperature at which fumaric acid is added thereto to the temperature at which crystallized L-aspartic acid is separated therefrom, to thereby deposit L-aspartic acid]

treating an ammonium fumarate solution with aspartase to generate an ammonium L-aspartate solution;

adding fumaric acid to said ammonium L-aspartate solution; and
cooling the resultant mixture at a rate of 0.1-5°C/min to crystallize L-aspartic acid.

11. (Amended) The method [of] according to claim 10, wherein [the solution] said resultant mixture from which L-aspartic acid is [deposited] crystallized is a homogeneous solution.